POWER PLANT CHARACTERISTICS FOR ELECTRIC SYSTEM MODELING

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Prepared by:
Joel B. Klein
Ross Miller
Richard Grix
California Energy Commission
Energy Information and Analysis Division
Electricity Analysis Office

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I. OVERVIEW

In the Order for the Second Phase of the Data Collection Rulemaking[1] and the Scoping Report Describing Resumption of the Rulemaking[2], the Commission's Ad Hoc Information Committee expressed its general intent for the review of Common Forecasting Methodology (CFM) regulations, forms and instructions. The Committee believes sufficient data should be acquired to adequately model the electricity system, that is, to simulate the western regional electricity market. As part of that effort, the Committee acknowledged a continued need for power plant physical, operational and financial characterizations.[3] This paper addresses the issues related to the collection of data relevant to these power plant characterizations and is issued to help facilitate participation at the September 2, 1998, workshop on Generator Data Needs. The September 2nd workshop will focus on power plant identification, and operational characteristics. A second workshop on September 17th, and a separate staff paper issued in advance of that date, will focus on power plant financial, fuel, and emission characteristics.

Table 1 of the Scoping Report summarizes the Committee's goals for regulatory revisions and provides a general overview of the rulemaking effort and indicates where the activities discussed in this paper fit in.. The subjects of the September 2 and 17 Workshops, this and the subsequent staff papers are part of the Facility Characteristics aspect of Generation Data (that is, Data category 2.b. in Table 1).

The goal of the Workshops is to encourage discussion of alternative sources of data such that the AHIC Committee can make an informed decision as to the most appropriate source of data balancing the cost, feasibility, practicality, equity and usefulness.

In pursuit of this goal, participants are requested to complete the attached forms prior to the Workshop. At the conclusion of the Workshop, participants will be asked to submit their completed forms, on an agreed upon timetable. This information will facilitate the preparation of a specific proposal, to be discussed at a subsequent workshop in the fall.

[1] Docket 97-DC&CR-1, July 30, 1998.
[2] Docket 97-DC&CR-1, July 28, 1998, page 21.
[3] Ibid.

II. ANALYSES AND STUDIES REQUIRING POWER PLANT CHARACTERISTICS

This section characterizes the various uses of this power plant data. This is provided as background information and not for the purposes of discussion at this workshop as the need for these analyses including modeling has been established with the adoption by the Commission at the June 24 business meeting of the key findings of the June 12 Ad Hoc Information Committee Report.[4]

The analyses/studies to be performed are too numerous to delineate in their entirety. Staff believes that the data needs of system modeling provide a reasonably comprehensive -- and the most demanding -- need for this data.

This description is broken into two parts: (1) the market modeling done to date and (2) the modeling that is envisioned for the future. Modeling played a large role in the regulated market and has continued to play a large role in the deregulated energy market. Staff expects that modeling of the new market will continue to be required by policy makers and concerned consumers.

MARKET MODELING TO DATE

Market modeling has been a key element of the resource planning process directed by the Energy Commission. Beyond the specific regulatory uses outlined in the Warren Alquist Act, a wide range of policy issues were assessed for a wide range of purposes by Staff throughout the Commission. The market modeling studies to date can be grouped as those done for internal uses within the Energy Commission for its own studies, those done for other government agencies, and those done for private entities.

Energy Commission Uses

The UPLAN model results are presently being used for a wide range of purposes throughout the Commission.

- Energy Information & Analysis Division (EIAD) - The models (formerly Elfin and now UPLAN) are used to forecast data used directly by the Fuels Office and indirectly by the Demand Office.
    - Fuels Office - Modeling by the Electricity Analysis Office (EAO) is used to produce a 20 year forecast of the natural gas consumption by electric utilities. This forecast is used as a necessary input to the Fuels Office's North American Regional Gas (NARG) model, in their preparation of natural gas prices for the Biennial Fuels Report (FR). Most recently, FR 97.
    - Demand Office - EAO modeling is used to provide a forecast of Market Clearing Prices (MCPs) that is used in the preparation of the Electricity Price Forecast, which in turn is used as an input to the demand forecasting models, and hence is fundamental to the Energy Commission's Demand Forecast process.
    - Electricity Analysis Office - EAO uses these models for a number of purposes – which in turn rely on the above Demand and Natural Gas Price Forecasts. For each biennial Electricity Report (ER), EAO models have been used to help the Commission in its evaluation of various electricity issues, including the cost effectiveness of conservation

[4] Draft Ad Hoc Information Committee Report on the Energy Market Information Proceedings, dated June 12, 1998, as modified by the Committee errata and amendments at the June 24, 1998 business meeting.

programs, the viability of new generation technologies, the emission reductions of different electric vehicle penetration levels and more recently market power issues. Despite the likely changes in the Energy Commission's process of developing and assessing policy initiatives, it is reasonable to assume that the development of future policy in whatever forum will require modeling. The Commission's adoption of the key findings in the AHIC June 12 Report confirm this assumption. Other EAO uses of modeling include the following:

  - Market Clearing Price Forecast which is used as the variable component of EAO's Electricity Price Forecast. This forecast is used both within and without the Energy Commission for various purposes.
  - Competitive Transition Charge (CTC) - Forecasts of MCPs are used as input to estimating when the CTC is paid off, and is also recalculated under alternative scenarios – such as estimating the effect of the high hydro year on the CTC.
  - Reliability - The RAM model was used in evaluating the adequacy of supply of electricity in the competitive market. The ISO and others use these results. (See below.)
  - Market Power - The UPLAN Model has been used to evaluate market power in the competitive market and effect of divestiture on market power.

- Energy Efficiency Division (EED) - EAO models are typically used to evaluate proposed conservation and DSM measures. At present, UPLAN is being used to provide a MCP Forecast (30 years) to revise the source energy multiplier used in evaluating the time-of-use cost-effectiveness of Title 24 Building Standards.

- Facilities Siting & Environmental Protection Division - EAO modeling is used in siting cases for three purposes:
  - Emission impacts - EAO modeling is used to estimate the effect of proposed power plants on emissions.
  - Evaluating the economics of transmission conductor sizing - This work is done under the umbrella of fostering cost-effective energy conservation. The conductor sizing of the proposed transmission is evaluated to see if it would be more economical to use a larger conductor size whose incremental cost would be less than the dollar savings in transmission losses. This reduction in transmission losses would be in the power plant owner's own economic interest while reducing wasted energy. For those cases where the proposed power plant would be entering the competitive market, EAO provides the Engineering Office a levelized MCP based on UPLAN's MCP Forecast as the cost of the electricity that flows on that transmission line.
  - Need analysis - Need analysis establishes whether a proposed power plant is needed in California in order to meet the electricity needs of the State. In theory, this analysis, which to date has been done on every power plant that has been proposed, should no longer be necessary. The language of ER 96, however, makes this posture uncertain, as it seems to only approve approximately 6,000 MW of new plants. It remains to be seen if the model will be called upon to perform some analysis that is comparable to a need analysis.

- Energy Technology Development Division (ETDD) - EAO models have been repeatedly used to evaluate the cost effectiveness of new technologies. The UPLAN model can be used to evaluate the commercial viability of new technologies that are receiving funding through the PIER program, which was established by AB 1890, the enabling legislation for restructuring.

Other Government Entities

Government entities other than the Energy Commission also make use of Staff's modeling knowledge, and model data and results. Although these modeling needs change from year to year, they are generally similar to those of the recent past:

- California Legislature and Governor - EAO does modeling in response to requests from the Legislature and the Governor. One of the more notable examples is the work done on reliability as mandated by Section 350 of AB 1890. The RAM model was used to support analysis performed by RMI, a consultant to the ISO. RMI is leading the Section 350 study (on reliability) of AB 1890.
- California Air Resources Board (CARB) - EAO has done various emission studies at the request of CARB. These include emission forecasts, emission impacts of proposed regulations and reduction of emissions due to Electric Vehicles. These have been done exclusively with the Elfin model.
- Air Quality Districts - EAO has done similar studies for the California air districts, particularly South Coast Air Quality Management District (SCAQMD).
- Federal Trade Commission (FTC) - EAO and the Engineering Office combined forces to use the MAPS model to perform a market power study on a proposed merger between PacifiCorp and Peabody Coal.
- California Public Utilities Commission (CPUC) - EAO has used the Elfin model to participate in workshops and hearings. EAO has also provided modeling data in support of CPUC modeling.
- Federal Energy Regulatory Commission (FERC) - Provide modeling in support of our testimony before FERC.

Private Entities

Numerous consultants, lending institutions and county assessors come to the Energy Commission for modeling data, modeling results or modeling advice.

- Lending institutions - Lending institutions contact us for financial data as they attempt to assess the viability of new entrants into the competitive market. We most typically provide a MCP Forecast (UPLAN) as well as interpretation of the MCP numbers.
- Consultants - Consultants are typically doing an assessment of the viability of their client's power plant in the competitive market. They contact us primarily for the MCP Forecast but also ask question regarding the assumptions and methodology used in developing the MCP values. Often they are looking for modeling input data and methodology in evaluating new entrants.
- County assessors - County assessor are trying to assess the effect of the competitive market on their tax revenues. These assessors contact us primarily for the MCP Forecast and ask question about the revenue changes that are likely to occur as QFs transition from Avoided Cost payments to depending on the MCP for revenue.
- Independent System Operator - The ISO has contacted the Commission for modeling data.
- Public Interest and Special Interest Groups - For example, Sierra Club, The Utilities Reform Network (TURN), Natural Resources Defense Council (NRDC)

The December 10, 1997 Market Clearing Price (MCP) Forecast was put on the Energy Commission's web site to see if it would prove useful to those interested in California's competitive electricity market. This MCP is now being downloaded at rate of almost two thousand times a month, which suggests it has usefulness and relevance to the new market. It also suggests that Commission modeling is facilitating the development of competitive markets, both in California and outside of California and is indeed providing market participants with the sort of information that they themselves find useful.

The Commission's modeling activity has also played a role in promoting the development of small consumer group cooperatives. The California Electric Users Cooperative in putting together their business plan used our MCP forecast. Our modeling analysis and forecasts provide a unique service to small consumer groups and businesses who otherwise could not afford to hire consultant firms to assist them in determining how they can take advantage of, and receive some of the benefits that the new competitive market has to offer.

THE FUTURE OF MARKET MODELING

Staff thinks that modeling of the new market will continue to be required by policy makers and concerned consumers. The Commission will continue to address policy questions that relate to the market and how the market will respond to alternative futures. These concerns might be characterized using the following questions:

- **How does a proposed change affect the energy market?** The change can be new legislation, new policy (energy or environmental), new governing rule (e.g., air quality emissions rules), new subsidy, revised market structure, or a change in the market structure.
- **How will the energy market affect natural resource utilization?** What effects on fuel resources and the environment have if DSM, renewables, R&D, and regulatory protections are changed under restructuring. This question is really a focus on getting the DSM, renewables, and R&D people to focus on the future projections of their programs under restructuring, and where they affect market modeling, providing the input assumptions.
- **Can we explain something we observed happening in the market?** Often something is observed to happen that can't at once be explained. Better understanding can be had by looking at complicated interactions revealed in modeling.

The Commissioners and others will look to an emulation of that market for answers as a part of addressing these issues. The fundamental questions of what will be the resulting economic, reliability and environmental effects of the proposed policies will continue to be asked. Examples of specific concerns that could be addressed with modeling are:

- Viability of new entrants into the market.
- The adequacy of new entrants to ensure reliability of the system.
- Viability of repowers and the effect on the environment.
- Viability of existing nuclear units.
- The economic and environmental effects of nuclear units shutting down.
- The impact of the market on out-of-state units and conversely their effect on the market.
- The effects of resource and transmission additions – both in-state and out-of-state – on the market: the effect on reliability, economics and environment.

- The effect of changes in fuel prices, demand changes and hydro availability on the market.

A wide range of analytic results driving programs throughout the Commission will require market simulation modeling as an effective way to produce MCP forecasts required as inputs to their analyses. ETDD will continue to want to know the viability of new entrants in the market. EED will continue to want to quantify the dollar effects of conservation and DSM measures. EFSPD will continue to assess the environmental effects of new power plants.

III. SUMMARY OF POWER PLANT CHARACTERISTICS

This section summarizes the power plant characteristics that are required as inputs to the Energy Commission models in order to provide the analysis and forecasts previously discussed.

The required power plant characteristic data are almost identical to those previously requested in the Common Forecasting Method (CFM) Forms, and should therefore be familiar to those who have previously participated in this process. **With the exception of the information requested on must-run contracts, no data is requested over and beyond that currently provided under existing CFM regulations.**

For purposes of organization, Staff has aggregated these data into five groups.

- Plant identifier data
- Plant operating data
- Plant cost data
- Fuel cost data
- Air emission factors

The last three items, plant cost, fuel cost and air emission data, are delineated within this paper as an overview, only. Subsequent reports describing variables in these three groups will be discussed at the September 17, 1998 Workshop.

Most of this data is required for all modeling. The only exceptions are those emission factors other than NOX and SOX which are only required for studies that require emission reporting. The NOX and SOX emissions factors are required for all modeling. NOX emission factors are required in order to compute the RECLAIM costs of units located in the SCAQMD. This is required for all modeling as these RECLAIM costs directly affect the dispatch decision. Similarly, SOX emission factors (for all western states units) are required for all modeling to determine the effect on dispatch due to the Federal allowance after 2001.

Plant identifier data - by unit

- Name of power plant unit
- Location: county, air basin, water quality management district, PX Zone
- Ownership by percent (%)
- Name plate capacity (MW)
- Date installed (Month/Year)
- Estimated retirement date (Month/Year)
- Unit type: nuclear, coal, geothermal, combined cycle, steam, CT, etc.

Plant operating data - by unit

- **Type of fuel used - N**uclear, coal, geothermal steam, oil, natural gas, etc. - Provide primary and secondary fuel types if unit is dual-fired.
- **Dependable capacity (MW) -** The capacity available during peak hours. For thermal units this is generally the warmest time of the year when system demand is high and unit efficiency is low.

If dependable capacity changes significantly by hour, month or season, this data should be provided, accordingly. If the dependable capacity is expected to change in the known future due to refurbishment or repowering, then this information would also be provided.

- **Thermal capacity (MW) by block** - The minimum load and preferably at 25, 50, 80 & 100% of dependable capacity.
- **Average heat rates by block** - For each of the above capacity blocks, the corresponding average heat rate (Btu/kWh) for each of the above load points. Alternatively, Staff could accept incremental heat rates or an input-output curve (Btu/hr) should either of these prove to be more convenient to the power plant owner.
- **Equivalent Forced Outage Rate (EFOR)** - The percentage of time during each year when the unit is not on maintenance but expected to be out-of-service due to equipment failures – partial derates would also be included. Absent an estimated values of EFOR, the plant owner could elect to provide the most recent five years of EFOR data.
- **Planned Outage Hours (POH)** - The number of hours annually that the plant is expected to be on maintenance in each of the forecast years.
- **Ramprate (MW/hour)** - The number of MW that a plant can increase its generation in one hour.
- **Cold start-up time (hours)** - The number of hours that it takes the power plant to go from being off-line and completely cold to being on-line and providing power.
- **Cold start-up energy (Millions of Btu/start)** - The corresponding energy required to come on line from a cold start.
- **Warm start-up time (hours)** - The number of hours it takes a power plant to come back on-line when it has been off-line some limited number of hours.
- **Warm start-up energy (Millions of Btu/start)** - The corresponding energy for a warm start.
- **Minimum down-time (hours)** - An imposed operational requirement whereby once a unit has been taken off-line, it will remain off-line for this period.
- **Minimum up-time (hours)** - An imposed operation requirement whereby once a unit has been started, it will be kept on-line for this specified period.
- **For hydro units** - The following values expected for an average, wet and dry hydro year.
  - Run-of-river capacity (MWh or average MW) - by hour, month and year
  - Total hydroelectric generating capacity (MW) - by hour, month and year
  - Total hydroelectric generating energy (GWh) - by hour, month and year
- **Pump-storage units** - The following values expected for an average, wet and dry hydro year.
  - Generating capacity (MW)
  - Pumping capacity (MW)
  - Efficiency of pump-storage (%)
  - Pump-storage reservoir size (GWh)
  - Pump-storage inflow (GWh)
  - Identify quantities of energy not available for optimization process (GWh)
  - Confirm that generating units count toward commitment and spinning reserve
- **Must-run status** - A description of any must-run contracts that the owner has as well as how often and to what extent it is expected that the plant will be called by the ISO.

Plant cost data

- Variable O&M ($/MWh) - Expected non-fuel variable operating costs.
- Fixed O&M ($/kW) - Expected non-variable operating costs that occur whether the unit is dispatched or not.

<u>For plants filing with the Commission for the first time and those which have changed ownership since the last filing, add the following additional items</u>

- Capital cost
  - Instant - year of dollars
  - Installed - year of dollars
  - Escalation rate of costs - real inflation
- Discount rate
- Economic carrying charge.
- Levelized fixed charge rate
- Plant life
- Cost of capital
- Other financial parameters as applicable

Fuel cost data

- Power plant cost of fuel by month for each year of the forecast period. If no forecast exists, provide historical monthly fuel costs for the previous three years.

Air emission factors

- For all thermal units: emission rates by all criteria pollutants and toxic wastes.

The discussions on plant cost data, fuel cost data and emission factors are covered in separate reports.

Data Delineation Needs

The above itemization is comprehensive in that it identifies all of the power plant characteristic data needed by the models -- or any other study. It does not differentiate between in-state and out-of-state data, but the sources of data themselves are sometimes different in this regard. Also, it does not deal with the size limits on individual power plant data. That is, is there a point of cut-off where a power plant is so small it is not worth modeling? If there is a size limit, how does Staff obtain appropriate information about the overall pool of small power plants? All of these points need to be considered in the data gathering decisions.

IV. DATA COLLECTION ISSUES

This section summarizes the issues surrounding data collection and attempts to focus the discussion in order to resolve -- or at least make progress on clarifying -- these issues: (1) accuracy and frequency of updating the data; (2) ensuring confidentiality of the power plant data where appropriate; and (3) identifying sources for obtaining the data.

The purposes for which the power plant characteristics are being collected have a direct effect on the nature of the data provided by respondents. Most of the purposes for which the Energy Commission intends to use the data involve some forward-looking assessment of the market or a particular feature of that market. Therefore, data submitted ought to be appropriate for such uses. Some data will be purely historical in nature (e.g., plant name, current owner, location, etc.) Other data will be expected values for the future based on historical performance, requiring judgment on the part of the respondent (e.g., block heat rates, forced outage rates, average water year generation, etc.). Other data will reflect respondent's future plans (e.g., capacity modifications. planned outage or maintenance hours, etc.)

How Power Plant Characteristics Data is Currently Collected

Within the previous Common Forecasting Methodology (CFM) data collection process, the California utilities provided individual unit data about the larger units they owned and aggregated data about the smaller non-utility units from which they purchased power. The simulation models used by the Energy Commission can't individually model the hundreds of generating units in the system. Nor does modeling every small individual unit necessarily increase the accuracy of the system modeling compared to modeling in aggregate. Larger units were modeled separately with heat rates while smaller units were aggregated into blocks of similar types of units then modeled as a block without heat rates.

More specifically, California utilities provided the described data every two years via CFM Form R-3A for individual generation units they owned, which tended to be large units. The utilities also provided, via CFM Forms R-4A-1 through 5 and R-4B, aggregated plant identification data about non-utility generation units from which the utilities purchased power under negotiated or standard offer contracts. The utilities collected information, or used CPUC-collected information, from the owners of many small individual generating units and aggregated this data into larger blocks of units sharing similar generating characteristics (e.g., gas-fired cogeneration, windmills, etc.). Some of the non-utility units that were large enough to have been licensed under CEC jurisdiction are identified individually. The utilities then developed modeling input assumptions for these aggregated blocks that were generic, based on averaged data and informed engineering estimates about the different technologies, rather than on knowledge of individual unit characteristics. Energy Commission Development Division Staff similarly made independent estimates of the availability and generating characteristics of small non-utility generation, which were used directly as model input assumptions.

This previous method of collecting the required plant characteristics is less suitable in the new industry environment; therefore, the goal of this paper is to help focus the September 2 workshop discussion on an adequate description of, and comparative benefits of, alternative methods for collecting the required data.

FREQUENCY OF UPDATES AND ACCURACY OF DATA

These are two interrelated concerns. One, how often does the necessary data have to be updated to meet the Energy Commission's needs? And second, how accurate does the data need to be? We will discuss these questions in the context of the plant identifier and plant operating data groups.

Frequency of Updates

Staff recommends that plant identifier and operating data be updated biennially, as was done in the CFM process. Although staff would prefer yearly updates because some of the products which rely on the data will be produced more frequently than biennially, we understand the increased costs of compliance this would entail. We believe that biennial data collection is a reasonable compromise. While changes may occur more rapidly in the competitive market, Staff feels that a two-year cycle for submitting data would appear less burdensome to the power plant owners. More frequent updates increase accuracy but also take time away from the time allowed for Staff to use the data for various issues analyses.

In Table 1, Staff summarizes the data items for the first two groups: plant identifier data and plant operating data. The first column repeats the plant characteristics, which were defined in Section III. The second column estimates the probability that data will change between biennial filings. The third column makes a preliminary assessment of whether the plant owner would request confidentiality for this plant characteristic. Table 1 is not a finding or position of Staff. It is provided solely as a starting point in order to focus discussion at the Workshop in order to identify and quantify the cost of providing the requested information using the participants knowledge and experience.

Staff expects that all 23 items in Table 1, as they may apply to a particular plant, would be available to the power plant owners for their own purposes and that the initial filing would be a matter of transcribing data. It is not the intent of Staff to create additional burden for the power plant owner but rather to have access to data that is already available.

Staff has identified four of the 23 items in Table 1 that would be expected to change from filing to filing:

- Thermal heat rates (Btu/kWh) by block
- Equivalent Forced Outage Rate
- Planned Outage Hours (POH)
- Must-run status

After the initial filing, it would largely be a matter of updating the above four items as they apply to the particular plant.

TABLE 1

	PROBABILITY THAT DATA WILL CHANGE BETWEEN FILINGS	PLANT OWNER MIGHT REQUEST CONFIDENTIALITY
Plant identifier data Name of power plant	None	No
Location	None	No
Ownership by percent	Very Low	No
Name plate capacity (MW)	Very Low	No
Date installed (Month/Year)	None	No
Estimated retirement date	Low	Yes
Unit type	Very Low	No
Plant operating data Type of fuel used.	Very Low	No
Dependable capacity (MW)	Very Low	No
Thermal capacity (MW) by block:	Very Low	Yes
Thermal heat rates (Btu/kWh) by block	High	Yes
Equivalent Forced Outage Rate	High	Yes
Planned Outage Hours (POH)	High	Yes
Ramprate (MW/hour).	Very Low	No
Cold start-up hours (hours)	Very Low	No
Cold start-up energy (MMBtu/start)	Very Low	No
Warm start-up hours (hours)	Very Low	No
Warm start-up energy (MMBtu/start)	Very Low	No
Minimum-down time (hours)	Very Low	No
Minimum-up time (hours)	Very Low	No
Hydro unit data	Very Low	No
Pump-storage unit data	Very Low	No
Must-run status	High	No

Level of Accuracy

The expected level of accuracy, with minor exceptions, would be that which plant owners have developed for the plant owners' own business purposes. That is, the power plant owner should not be required to develop forecasts or conduct measurements specifically for this filing, but rather should provide existing data.

CONFIDENTIALITY CONCERNS

Existing confidentiality regulations permit respondents to request the Energy Commission hold confidential requested information that contains trade secrets or where otherwise disclosure would cause a loss of competitive advantage. Also, existing confidentiality regulations categorically prohibit disclosure of information provided by either non-utilities or utilities that could be used “to determine the fuel use or electricity generation of an individual non-utility generator.

Existing and proposed confidentiality regulations can affect the Energy Commission’s access to and use of power plant characteristic data collected by other entities (e.g. the Energy Information Administration of the U.S. Department of Energy.)[5] When different confidentiality regulations conflict in their treatment of specific data, such conflicts can be overcome by a variety of means--acquiring the data directly from respondents, or acquiring respondents’ individual permission to use data submitted to another entity who is required to keep the information confidential, or developing mechanisms for entities who collect confidential data to share it with other entities with a “need to know” but to guarantee its continued confidentiality.

A goal of workshop participants will be to collectively identify the specific generation characteristics for which respondents will:

- likely apply for confidential treatment under existing regulations (and to identify the specific rationale for that application).
- likely assert are included in the categorical protection afforded to non-utility data.
- likely propose in the OIR new categorical protections be included in revisions to confidentiality regulations.
- experience conflicts between confidentiality protections granted by various regulations.

Individual generator respondents may claim (1) that their heat rates, plans for capacity modifications, and other information qualify as trade secrets, that disclosure of such information would cause a loss of competitive advantage, or (2) that non-utility generator information qualify for the categorical confidentiality protection afforded information that could be used “to determine the fuel use or electricity generation of an individual non-utility generator.” Secondary sources of this generator information (e.g., scheduling coordinators, CalISO, CalPX, manufacturers, EIA) may claim that their confidentiality agreements with generators prohibit their sharing of confidential information without the generator’s express permission, regardless of the confidentiality guarantees offered. The Energy Commission may have to extend its effective confidentiality guarantees to any data received from secondary sources, and to do so in such a way as to indemnify the secondary source from penalties of inadvertent disclosure.

Nondisclosure Alternatives -- Nondisclosure of confidential data can be maintained in a variety of ways. The information may be used in analyses but not revealed in any form, aggregated with other data to protect individual respondent confidentiality, or used to develop generic assumptions for use in analysis. Currently, all three methods are employed in the use of confidential information. For example, modeling assumptions about generating characteristics for all large and small non-utility generation are aggregated to maintain the confidentiality of non-utility supplier’s individual generating unit operating characteristics within the publicly-available data sets.

The third column of Table 1 summarizes those items that Commission Staff expects that the power plant owner might request to be held confidential. For a thermal plant, Staff expects that this would be the following:

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[5] Attachment D includes a list of electric power survey data it collects which EIA proposes be treated confidentially and a list it proposes not be treated confidentially.

- Thermal heat rates (Btu/kWh) by block
- Equivalent Forced Outage Rate
- Must-run status

For hydro plants, this would be the following:
- Hydro or pump-storage characteristics.

ALTERNATIVE SOURCES OF POWER PLANT DATA

Staff recognizes, along with the other interested parties, that it is necessary to use existing data sources where practicable to avoid unnecessarily burdening the power plant owners with multiple requests for the same information. Staff has sought out alternative sources of this data and welcomes references from interested parties for other reliable sources of data.

At the same time, Staff recognizes that with ongoing creation of competitive markets, more and more power plant owners will be imposing confidentiality and some of these sources of data will "dry up" and therefore can not be depended upon for the long run.

Energy Commission Staff has identified nine sources of the power plant characteristics that are relevant to the present discussion:

- Power Plant Owner
- Scheduling Coordinators
- Energy Information Agency (EIA)
- California Power Exchange (PX) and Independent System Operator (ISO)
- Western Systems Coordinating Council (WSCC)
- North American Electric Reliability Council (NERC)
- Northwest Power Planning Council (NPPC)
- U. S. Bureau of Reclamation (USBR)
- Manufacturers of Generating Equipment

Power Plant Owners

Power plant owners -- or their designated representative -- have this data as a matter of necessity in that it is needed initially for the feasibility studies and subsequently in the continued operation of the power plant.

Scheduling Coordinators

Scheduling coordinators may not have all the necessary data, but if they do then it would be possible for them to aggregate the data from small units to an equivalent unit suitable for modeling. Modeling thousands of units is not really practical as it increases run times. The modelers of the WSCC try to keep the number of units represented to less than 1000 -- Staff is attempting to meet a self-imposed limit of 500. This requires that the capacity and operating characteristics of smaller units be combined into equivalent units. Combining multiple units into an equivalent unit has the additional advantage of ensuring confidentiality as the individual characteristics of these plants are not specifically designated in the data set and can not be inadvertently disclosed.

Providing this data to the Energy Commission -- and others -- however, places the scheduling coordinator in the position of having to maintain confidentiality outside the normal scope of their current responsibilities and imposes reporting burdens which would increase their costs of doing business.

Energy Information Administration (EIA)

The EIA is an independent branch of the U. S. Department of Energy that is responsible for gathering, analyzing and disseminating energy-related information. EIA information is available through various publications and its web site.[6]

Staff has reviewed the EIA information available on the internet and has met with EIA representatives. Staff has concluded that with a few exceptions described below, the data presently collected by the EIA is not directly useful in the modeling of power plants. The data collected by the EIA is largely historical data, which can prove useful in benchmarking a model -- that is, trying to replicate a known year for the purpose of validating a model. But, the power plant characteristics necessary for forward-looking modeling are not directly collected by EIA.

For example, EIA collects full load heat rates and data that allows one to calculate average historical heat rates but not the information necessary to model the unit (as this data says nothing about what the heat rate is at the minimum generating level, the maximum generating level, or any other level.) In regard to maintenance and forced outage rates, EIA provides no data whatsoever. EIA provides no data on ramp-rates, start-up times/costs, or minimum up and down times. This data is simply not modeling data. It is historical, monitoring data.

EIA does collect historical hydro generation and fuel costs. Staff relied on other sources of data for the hydro data but was able to use the coal cost data in its modeling. EIA also collects annual generation data for non-utility power plants which could be a source of information from which to derive aggregated modeling assumptions for smaller power plants or power plants where there is little value in modeling the individual power plant as dispatchable, with heat rates. This may substitute for the current source of aggregated generic modeling assumptions collected via the CFM Form 4 series.

California PX and ISO

The Power Exchange (PX) and Independent System Operator (ISO) must necessarily have power plant characteristic data to do their jobs. Both of these entities have market surveillance and compliance units that require this data at the finest level of detail. The PX has recently posted its preliminary data requirements in this regard[7] and these data needs appear to be virtually the same as the Energy Commission's needs in regard to power plant characteristics. They have also noted their intention to keep all of this data confidential without exception.[8]

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[6] Mail address is National Energy Information Center (NEIC); Energy Information Administration, EI-30; Forrestal Building, Room 1F-048; Washington, DC 20585. Its E-MAIL address is ***infoctr@eia.doe.gov***. Its web site address is ***http://www.eia.doe.gov***.
[7] Internet address: ***http://www.calpx.com/MarketCompliance.htm***
[8] Ibid.

It is not surprising that this list of data is the same since as Staff has given the ISO copies of CFM filings and Elfin input data sets. We expect that both the ISO and the PX have reviewed these CFM fillings in their own delineation of the data necessary for market monitoring activities. Our speculation is that the PX is going to need to be able to model the market, and most likely will end up using a chronological transmission-oriented production-cost model similar to the UPLAN.

Staff has approached the ISO in regard to obtaining the power plant characteristics data from them in the future. Their response was that they would not release any data without permission from the individual power plant owners. Given the well known concerns of these power plant owners about not wanting to make their data available except when it is absolutely necessary, we can expect that the majority will not comply without some mandate.

A Energy Commission mandate which can be satisfied by a joint filing by power plant owners to the PX, ISO and the Energy Commission would be the least burdensome and efficient alternative for the power plant owners. The filings would in all probability be electronic and the incremental cost of providing the data to the Energy Commission would be a matter of adding the Energy Commission's internet address to the distribution list.

WSCC

The Western Systems Coordinating Council (WSCC) was organized in 1967 to address the mutual interests of utilities located in the western United States, Canada and Mexico. It provides the regional coordination necessary to ensure adequate and reliable electric service for all of the related customers. The Council develop planning and operating reliability criteria and policies: monitor compliance with these criteria and; policies; and facilitate a regional transmission planning process.

WSCC periodically develops a 10-year plan that summarizes the existing and expected resources, loads, fuel and transmission facilities.[9] Although this forecast is useful in identifying potential resource additions, it does not provide power plant characteristics necessary for modeling.

Another alternative within the WSCC is to use the data developed for the MAPS model. This data is developed by a joint modeling team of WSCC and utility staff, and is made available to the Energy Commission under terms of confidentiality.

Commission Staff has encountered a number of problems in relying on the MAPS data for our own modeling activity. First, Staff has no control over when this data is made available to us. Previous requests for data from the WSCC have involved long waiting periods. Data from the MAPS model was not available in time for our December 10, 1997 MCP Forecast. We also have had trouble reconciling MAPS data to the California utility data submitted to the Commission in the CFM process. This compromises our confidence in relying solely on the data obtained through the WSCC. We also expect that as the competitive market develops that the MAPS database will also become more constrained by confidentiality concerns and may not be available even to the WSCC itself.

[9] *10-Year Coordinated Plan Summary 1997-2006* available from University of Utah research park, 540 Arapeen Drive, Suite 203 Salt Lake city, Utah 84108-11288 or from its web site ***WWW.WSCC.COM***.

North American Electric Reliability Council (NERC)

NERC compiles statistical information on the performance of the major types of electric generating units and their major component groups. They provide the latest five-year generating unit availability statistics on capacity-weighted and unweighted bases. These statistics aggregate the data submitted by all utilities in the US. The outage and availability data is then compiled according to unit type and a megawatt size range. No unit specific information is available, nor is data presented on a regional basis. This would be the data source of last resort for forced outage and maintenance data. Given the precarious nature of operating reserves this summer, using generic data to determine the availability for resources for meeting peak demand would be a totally illusory exercise. To guarantee reliability one needs real data on real power plants.

NERC also provides annually an electronic version their Electricity Supply and Demand Database (ES&D). Staff has relied heavily on this data for modeling resources out-of-state. The database includes information on the location and dependable capacity of power plants in the WSCC region, their fuel use, both primary and secondary, their availability status and planned retirements. The database includes a 10-year demand forecast for each of the regions within the WSCC and also provides a list of both planned generation and transmission additions. While the NERC ES&D database is a valuable resource that staff will continue to rely on, it does not provide unit specific parameters such as heat rates, forced outage hours and planned maintenance hours, or operating parameters such as ramp rates, minimum up and down times, etc..

Northwest Power Planning Council (NPPC)

The NPPC is a four-state compact formed by Idaho, Montana, Oregon and Washington to oversee electric power system planning and fish and wildlife recovery in the Columbia River Basin. The Council was initiated by Congress through the Northwest Power Act of 1980 (Public Law 96-501). Information on the NPPC can be found at its web site.[10]

The NPPC provided Staff with their modeling characterization for the hydro resources, both federal and nonfederal in the Pacific Northwest.

United States Bureau of Reclamation (USBR)

The USBR is responsible for managing, developing and protecting Federally owned water and water related resources. It administrates 348 reservoirs and 58 electric power plants. Information about USBR functions and facilities can be found at its web site.[11]

The USBR makes available on their web site 20 years of monthly hydro generation by dam site for all USBR facilities. Staff used this data to create a typical hydro generation profile for USBR facilities in the WSCC.

[10] The internet address is ***http://www/nwppc.org/***

[11] The central internet address for the USBR is ***http://www.usbr.gov/main***.

Federal Energy Regulatory Commission (FERC)

The FERC is an independent regulatory agency within the Department of Energy (DOE). It has many of the responsibilities of the former Federal Power Commission, including power to establish and monitor rates charged for electricity and for the transportation of oil and gas by pipeline.

In October of 1997 the three California Investor Owned Utilities, (PG&E, SCE, and SDG&E) filed with the Federal Energy Regulatory Commission copies the Master Must-Run Agreement between these utilities and the California Independent System Operator. The Agreements contained operational information on the units similar to that which the Commission requested in the CFM forms which is needed for modeling. The information in the Agreements includes cold, hot and warm start hours and costs, ramp rates, unit minimum up times, fixed O&M costs, and variable O&M costs.

The limitation on this data is that it is only available for units that have a must-run agreement with the ISO.

Manufacturers of Generating Equipment

The various generating equipment manufacturers are another source of this same data. Relying on them as a sole source for information on operating characteristics, however, presents a number of difficulties.

Typically the data provided by manufacturers is generic in nature. It does not address how a unit will operate once in location or how it will change over time. The dependable capacity of a thermal unit is dependent on its location -- less efficient in a warmer climate -- and season -- less efficient during the summer. Heat rates (efficiency) decline over time but at the same time can be improved back to near their original level through refurbishment. This is data that can only be provided by the owner/operator of the power plant. Forced outage and maintenance also vary over time -- again somewhat of a function of age and refurbishments -- and are not necessarily predictable at their original levels.

Assuming that Energy Commission Staff could determine what unit a power plant owner had purchased, the manufacturer may be reluctant to provide some of the necessary information out of concern for the power plant owner’s rights.

Finally, there is the issue of Staff workload. It would be extremely burdensome -- and beyond the present staffing levels -- for Staff to contact the manufacturers for the approximate 2000 generating units in the WSCC, in the hope of getting some general understanding of the operating characteristics of each unit under ideal testing conditions and then construct a good guess as to how the unit would perform in the field at a particular location over time.

V. REQUEST FOR ADDITIONAL INFORMATION

The discussion of issues in Section IV is for the purpose of facilitating discussion at the Workshop. **Interested parties should fill out Attachments A, B and C with their own assessment of the subject issues and be prepared to support their position at the Workshop. Staff requests that parties be prepared to submit their completed forms at the conclusion of the Workshop -- or some mutually agreed upon time schedule shortly after the workshop.**

The information provided by the Workshop participants will help to refine Staff's understanding of the costs of various alternatives for providing this data, special issues associated with specific variables, and a range of opinions about which variables may be considered as trade secrets. Assessing these responses will facilitate preparation of a specific regulatory data submission proposal later in 1998.

APPENDIX A
ENERGY COMMISSION MARKET MODELS

This Appendix describes the models for which the power plant characteristic data is requested. The Energy Commission presently has four market simulation models that require this data: Elfin, UPLAN, MAPS and RAM. The Elfin model has been used by the Energy Commission for about 15 years to do single service area resource planning studies for the regulated electric industry. With the deregulation of the generation market, the Energy Commission turned to UPLAN to emulate power plant bidding and multi-area dispatch of the new competitive market. Due to the importance of transmission in the competitive market, the Commission began investigating the use of the MAPS model in order to validate the transmission emulation of UPLAN and to do various transmission studies. The RAM model was later developed by Energy Commission Staff in order to assess supply adequacy in the WSCC for the ISO.

- Elfin - This model was developed by the Environmental Defense Fund (EDF). During the time it was used by the Commission -- to replicate the regulated electricity industry -- Elfin was a single area (one utility at a time) production cost and capacity expansion model.[1] It had no transmission representation.[2] Elfin is a probabilistic load duration curve model, which means that it can not do hourly studies -- it can only do subperiod studies (on-peak vs. off-peak). Elfin, therefore, can not forecast hourly market clearing prices. Although Elfin was appropriate for the long-term resource evaluation studies that were done for the regulated market, it has not been suitable for the near term studies done for the deregulated market. Only recently have changes been made to the Elfin model to make it capable of emulating the features of the new competitive market and these changes are still in the developmental state.[3] The UPLAN and MAPS models have been used exclusively in staff's analysis of the competitive market issues.

  Elfin, however, remains useful in doing emissions studies as it is the only model which has been benchmarked (run in an historical year to see if it can reproduce the known energy and emissions for that year). Elfin's capacity expansion capability is also something that is lacking in both

[1] A production cost model emulates the dispatch of a known electric utility system, delineating the associated costs, fuel use and efficiencies (e.g., system cost, unit costs, marginal cost, average heat rates, capacity factors). In the case of the regulated market, the dispatch is based on the actual costs of operation; in the deregulated market, the dispatch is based on bids. A capacity expansion model identifies resource additions. In the case of the regulated market, it identifies the least cost units necessary to maintain reliability of the system, and at the same time identifies any additional resources that can be justified on the basis of reducing system costs. In the deregulated market, additions are based solely on whether they make sufficient revenue to be able to successful in the market.

[2] Elfin had a brief history as a multi-area model with simplistic transmission representation when it was used to evaluate the proposed merger of Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E). That version of Elfin was used primarily for that series of studies and not maintained thereafter. It was not of the complexity necessary for the deregulated electricity market.

[3] Subsequent to the Energy Commission’s changing to UPLAN, EDF has been modifying Elfin to be a market model. It now emulates both the bidding of the competitive market and multi-area transmission. There are three modes of transmission emulation: transport, direct current (DC) and alternating current (AC) transmission. Elfin uses transport transmission -- also known as contract transmission – the simplest of these three options. Transport transmission emulates the limits in flows between the utilities in the western states but not the electrical parameters of the transmission lines. Elfin’s bidding mechanism is still less sophisticated than that of UPLAN.

UPLAN and MAPS and is useful in doing cost comparisons of various supply options and conservation measures. It is possible that the Elfin model could evolve further and meet our needs for simulating the competitive market. Elfin's low cost, excellent documentation, ease of use, minimal confidentiality restraints, and good support are factors that weigh heavily in favor of its continued use. Also, many of the participants in proceedings at the Energy Commission and the CPUC have access to and familiarity with the Elfin model which provides a common framework for addressing issues.

- UPLAN - Owned and maintained by Lotus Consulting Group (LCG), UPLAN was developed -- at least in part -- to do an analysis of the competitive market for the Energy Commission.[4] It is a chronological model (runs hour-by-hour). UPLAN emulates both the generation and transmission of electricity throughout the western states. It's capable of emulating transmission in three modes: transport, Direct Current (DC) and Alternating Current (AC). Transport is the simplest emulation capturing only the general magnitude of flows between utilities. AC is the most complex and it is this feature that makes UPLAN unique in comparison to other models.

  As with all transmission models, UPLAN uses an equivalent circuit that represents loads and resources with a reduced equivalent number of units. It is presently using 14 demand areas, 88 nodes, 320 power plants and 219 transmission lines but is Staff is expanding the size of this representation to validate this smaller equivalent circuit.[5]

  Staff relied, in part, on the UPLAN model for its December 10, 1997 Market Clearing Price Forecast.[6]

- MAPS - This model, owned and maintained by General Electric (GE), is being used by the Energy Commission's Engineering Office to gain an understanding of transmission congestion issues, in general, and more specifically to evaluate transmission issues related to new generation in siting cases. MAPS represents 837 power plants and 1115 transmission lines.

  MAPS has also been used to validate UPLAN transmission flows. It is a well-established model with a more detailed representation of generation and transmission than is in UPLAN. Unlike UPLAN, however, MAPS does not use a true AC representation. It uses a DC transmission emulation that ignores the true AC nature of transmission lines – GE and others argue that this compromise is not significant. It also lacks a mechanism whereby it can create market bids based on the bidders operating costs, although it can accept market bids created outside of the model. While we are presently trying to expand the UPLAN model transmission network up to a level of detail more comparable to MAPS, MAPS remains as our benchmark (standard) for estimating and validating transmission flows.

- RAM - The Reliability Assessment Model (RAM) was developed by Energy Commission Staff [7]

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[4] *Modeling Competitive Energy Market in California: Analysis of Restructuring*, dated October 3, 1996 by Rajat Deb, Richard Albert and Lie-Long Hsue.

[5] Staff is in the process of expanding this representation to 260 demand areas, 1,400 transmission lines and 500 power plants.

[6] *Interim Staff Market Clearing Price Forecast for the California Energy Market: Forecast Methodology and Analytical Issues*, by Joel B. Klein -- available on the Energy Commission's web site: **www.energy.ca.gov/papers** (67 pages).

[7] Commission Staff Albert Belostotsky and Pat McAuliffe.

initially to assess the adequacy of the generation supply in the western states under deregulation. It is an Excel spreadsheet model that assesses the available capacity in the western states while accounting for transmission limitations. On the one hand, its simplicity limits the model, while on the other it allows for easy identification of system constraints and supply deficits.

The Elfin, UPLAN and RAM models are used by Electricity Analysis Office. The MAPS model is used by the Engineering Office to evaluate transmission reliability issues. Both Offices collaborate on all models for various studies.

Although we have used other models in the past, it is these four models that we are likely to use in the near term and which require the data we are identifying in this paper. One minor distinction can be made in terms of the data that all three models require. Elfin and RAM do not require the chronological data (data which has an hourly component) such as ramp-rates, start-up costs and times, and minimum up and down times.

Because of the time and personnel required to maintain several different models it is expected that over time as the Commission gains understanding of these models and comes to understand which models are most appropriate for our needs, the number of models will become less.

APPENDIX B
EIA PROPOSAL FOR CONFIDENTIALITY OF ELECTRIC POWER SURVEY DATA

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Table 1.--Confidential Data Elements

Data elements	Forms affected
Future--generating capacity: 1--retirement dates 2--changes to existing units 3--planned generating unit data	EIA-411 generator(s) planning data for: (a) existing (changes to); (b) retirement date(s) (c) new generators (all information) EIA-767 planning data for: (a) new plants/equip.; (b) equipment updates; (c) retirement date(s) EIA-860 planning data for: (a) generator updates; (b) retirement date(s); (c) new generator(s) EIA-867 planning data for equipment
Heat rates:	EIA-411 (a) heat rate data EIA-767 (a) boiler efficiency EIA-860 (a) heat rate data
1--Sales for resale	EIA-412 name(s), quantities, demand charges, energy/ other charges, revenue/settlements 2--Contracts EIA-867 names, maximum contract amount, amount delivered
Wholesale purchases/contracts with sellers	EIA-412 name(s), quantities, demand charges, purchased/exchanged, energy/other charges, total costs EIA-867 name(s), maximum contract amount, amount delivered
Fuel inventory--stocks	EIA-759
Financial data--environmental equipment	EIA-767
Sales end user(s) name(s)	EIA-867 name(s), maximum contract, amount delivered

Source:

[Federal Register: July 17, 1998 (Volume 63, Number 137)]
[Notices]
[Page 38620-38625]
From the Federal Register On-line via GPO Access [wais.access.gpo.gov]
[DOCID:fr17jy98-46]

List of Data Elements That Will Not Be Held Confidential

Data elements	Forms affected
Existing generating capacity	EIA-411 all data not listed as confidential on on existing generating units such as identifiers, type, capacity, fuel, commercial operation date
	EIA-767 all data not listed as confidential on steam-electric plant configuration such as existing boiler design parameters (excluding heat rates & amp; retirement date), existing plant configuration, existing generator information
	EIA-860 all data not listed as confidential on existing generating units such as identifiers, type, capacity, fuel, commercial operation date
	EIA-867 existing facility QF or EWG status, nameplate rating, existing electric generator identification/ nameplate rating/ generating unit type/prime mover type/ energy source
Net or Gross Generation	EIA-412 net generation by steam, nuclear, hydro, other
	EIA-759 net generation by plant & amp; energy source
	EIA-767 net monthly generation by generator
	EIA-867 gross generation by generator
	EIA-900 gross generation by facility
Fuel Consumption	EIA-759 fuel consumption
	EIA-767 fuel consumed by boiler (quantity and quality)
	EIA-867 quantity and quality of fuel consumed
Environmental Characteristics	EIA-767 byproduct distribution for the year, air emission standards by boiler, existing cooling system/particulate collector/flue gas desulfurization/ stack and flue design parameters and information
	EIA-867 facility environmental equipment information
Financial Data	EIA-412 public electric utility financial data not listed as confidential: balance sheet, income statement, cash flows, cost of plant in service, taxes, O&M expenses, employee statistics
Emergency Reports	EIA-417R
Retail Sales, Revenue, Number of Consumers	EIA-826 monthly sales, revenue, number of consumers by customer class by State
	EIA-861 annual sales, revenue, number of consumers by customer class by State, electric operating revenues
	EIA-867 sales to end users
	EIA-900 monthly sales to end users
Sources & Disposition of Energy	EIA-861
	EIA-867
	EIA-900 monthly sales for resale
Demand Side Management Information	EIA-861
Distribution System Information	EIA-861

ATTACHMENT A
DATA COLLECTION COSTS
September 2, 1998 AHIC Workshop

PREPARED BY: ___________________________
ADDRESS: ________________________________
____
PHONE NUMBER: (   )   -
ON BEHALF OF: ____________________________
DATE: _____________________________

TABLE A: COSTS ASSOCIATED WITH PROVIDING POWER PLANT DATA

POWER PLANT CHARACTERISTIC*	COST OF PROVIDING DATA ($)	DESCRIPTION OF TASK
Plant identifier data - by unit Name of power plant		
Location		
Ownership by percent		
Name plate capacity (MW)		
Date installed (Month/Year)		
Estimated retirement date		
Unit type		
Plant operating data - by unit Type of fuel used.		
Dependable capacity (MW)		
Thermal capacity (MW) by block:		
Average heat rates (Btu/kWh) by block		
Equivalent Forced Outage Rate		
Planned Outage Hours (POH)		
Ramprate (MW/hour).		
Cold start-up time (hours)		
Cold start-up energy (MMBtu/start)		
Warm start-up time (hours)		
Warm start-up energy (MMBtu/start)		
Minimum-down time (hours)		
Minimum-up time (hours)		
Hydro unit data		
Pump-storage unit data		
Must-run status		

* Power plant characteristics are defined in Section II

ATTACHMENT B
CONFIDENTIALITY OF DATA
September 2, 1998 AHIC Workshop

PREPARED BY: ___________________________
ADDRESS: _______________________________
____
PHONE NUMBER: (   )   -
ON BEHALF OF: ___________________________
DATE: ___________________________________

TABLE B: CONFIDENTIALITY CONCERNS

POWER PLANT CHARACTERISTIC*	**CONFIDENTIALITY REQUIRED (Yes/No)**	**RATIONALE FOR CONFIDENTIALITY****
Plant identifier data - by unit Name of power plant		
Location		
Ownership by percent		
Name plate capacity (MW)		
Date installed (Month/Year)		
Estimated retirement date		
Unit type		
Plant operating data - by unit Type of fuel used.		
Dependable capacity (MW)		
Thermal capacity (MW) by block:		
Average heat rates (Btu/kWh) by block		
Equivalent Forced Outage Rate		
Planned Outage Hours (POH)		
Ramprate (MW/hour).		
Cold start-up time (hours)		
Cold start-up energy (MMBtu/start)		
Warm start-up time (hours)		
Warm start-up energy (MMBtu/start)		
Minimum-down time (hours)		
Minimum-up time (hours)		
Hydro unit data		
Pump-storage unit data		
Must-run status		

* Power plant characteristics are defined in Section II
* * Describe how disclosure of this information would cause a loss of competitive advantage.

ATTACHMENT C
SOURCES OF DATA
September 2, 1998 AHIC Workshop

PREPARED BY: ___________________________
ADDRESS: ________________________________
____
PHONE NUMBER: (   )   -
ON BEHALF OF: ___________________________
DATE: ___________________________________

TABLE C: SOURCES OF INFORMATION FOR DATA

POWER PLANT CHARACTERISTIC*	ALTERNATIVE SOURCES FOR DATA
Plant identifier data Name of power plant	
Location	
Ownership by percent	
Name plate capacity (MW)	
Date installed (Month/Year)	
Estimated retirement date	
Unit type	
Plant operating data Type of fuel used.	
Dependable capacity (MW)	
Thermal capacity (MW) by block:	
Average heat rates (Btu/kWh) by block	
Equivalent Forced Outage Rate	
Planned Outage Hours (POH)	
Ramprate (MW/hour).	
Cold start-up time (hours)	
Cold start-up energy (MMBtu/start)	
Warm start-up time (hours)	
Warm start-up energy (MMBtu/start)	
Minimum-down time (hours)	
Minimum-up time (hours)	
Hydro unit data	
Pump-storage unit data	
Must-run status	

* Power plant characteristics are defined in Section II